ATTACHMENT 12 – PROTECTING CANADA'S COASTS USING LASER REMOTE SENSING TO DETECT AND TRACK OIL SPILLS, MINISTER OF THE ENVIRONMENT, 2007

Protecting Canada's Coasts

Using Laser Remote Sensing to Detect and Track Oil Spills

The Problem

Oil pollution discharged from ships traveling off Canada's coasts causes the death of hundreds of thousands of seabirds every year.

With the longest coastline in the world, Canada is particularly vulnerable to the risk of oil spills and the huge environmental and socio-economic losses they can cause.

Oil spills kill fish, marine mammals, birds, and plant life. Even small spills damage ecological balance and cause long-term harm to wildlife. The commercial fishing industry suffers losses from damage to boats and equipment. Aquaculture operations and tourism feel the impact when marine oil spills migrate towards coastal areas. Public concern about contamination means a drop in seafood sales.

Emergency response personnel must locate and monitor the spill to assess environmental and potential health risks, and then decide on countermeasures to clean up contaminated areas. As an oil slick moves and spreads, environmental processes alter its character. Some processes are important immediately after the spill; others emerge as time goes on. To prevent further damage to the environment and wildlife, emergency response teams must understand the nature and movement of the spill – a challenging task with a moving, changing target.

Seeking Solutions through S&T

The Emergencies Science and Technology Division of the Environmental Science and Technology Centre (Ottawa) serves as the primary centre of scientific and technical support and analysis for the prevention, preparedness and emergency response functions of Environment Canada's Environmental Emergencies Program. The group specializes in research and development on the properties, behaviour, effects and in-situ treatment of spilled hazardous materials, including oil spills.

Over 100 ship-based oil pollution incidents are reported each year and many more are missed. More than 300,000 seabirds exposed to oil spills are killed each year off the Atlantic coast alone – equivalent to the impact of an Exxon Valdez oil spill. Fisheries and Oceans Canada estimates that Canada's ocean-related industries generate more than $22 billion per year for Canada's economy.

This research is mandated under the 1973 Cabinet Decision on Environmental Emergency Activities.

Scientists equipped a DC-3 aircraft with specialized remote-sensing equipment that included a Scanning Laser Environmental Airborne Fluorosensor (SLEAF). This active real-time sensor can operate during full daylight or in total darkness to detect and classify oil. SLEAF technology can also discriminate between oiled and un-oiled weeds, and detect oil in a variety of marine and shoreline environments including on water, snow, ice and beaches.

They also tested their Laser Ultrasonic Remote Sensing of Oil Thickness (LURSOT) sensor in the DC-3 aircraft. Developed in collaboration with the Industrial Materials Institute of the National Research Council, Imperial Oil and the United States Minerals Management Service, the LURSOT sensor accurately measures oil-slick-on-water thickness.

In April 2005, Environment Canada scientists were successful in the world's first airborne absolute measurement of oil slick thickness in a test tank set up on the grounds of the MacDonald-Cartier International Airport in Ottawa.

The SLEAF system has been tested in two flight demonstration programs, first in the waters around Newfoundland and the Gulf of St. Lawrence in the late winter/early spring of 2004, then during a demonstration program around Vancouver Island in March and April 2006, as part of the federal government's Birds Oiled At Sea Program.

Flights over the site of the sinking of the ferry, *Queen of the North*, which occurred on March 22, 2006, indicated light oil sheens in the region immediately surrounding the location of the sunken vessel; however, the extent of the oiling appeared to be greatly reduced from images collected in the days shortly after the ferry had sunk, indicating the spill had dissipated.

Flights over the shipping lanes of the Strait of Juan de Fuca located several slicks of petroleum oil, some not visible to the naked eye and only detected by use of the SLEAF technology. With this technology, Environment Canada scientists were able to show reason for concern about oil releases in the shipping lanes around Vancouver Island.

Transforming Knowledge into Action

Who can use these results?


Photo credit: Edward Owens

This technology improves our capacity to identify oil spills more accurately, to distinguish between oil and other possible contaminants, and to map sources of oil more precisely. Emergency responders are able to use the information it produces to make effective decisions on response techniques and countermeasures more rapidly than before – reducing the risks and limiting the losses.

Scientific data collected using this improved technology can be used as evidence to help identify and prosecute polluters. In 2005, Canada moved to forcefully protect its marine environments from polluters through Bill C-15, which amends the *Migratory Birds Convention Act (1994)* and the *Canadian Environmental Protection Act (1999)*. The Bill provides clarity for enforcement officials in cases of marine pollution, and to owners and operators of vessels in waters under Canadian jurisdiction.

Benefits to Canadians

Under Bill C-15, shipping companies and their ships' officers will be held accountable for any illegal dumping of bilge oil in Canadian waters.

Any vessel of more than 5,000 tonnes found guilty would face a minimum fine of $100,000 for a summary conviction and $500,000 for an indictable offence.

Laser type remote sensing technologies are valuable tools for scientists responding to oil spills, particularly in conditions where direct at-sea presence may not be possible or safe. These technologies are also advantageous because they do not inherently depend on the ambient light conditions and they do not disturb the surface of the water.

Canada's ocean regions total almost six million square kilometres, equivalent to almost 60 percent of Canada's land mass. Our oceans are an inherent part of the Canadian environmental, social, cultural and economic fabric.

Improved surveillance, enforcement, and pollution prevention are critical to our economy and our environment. This research and its real-world application have made improvements possible, helping protect Canadians from risks to the environment, wildlife and human health.

Photo credit: Carl E. Brown

For more information:

Environment Canada's Environmental Emergencies Program
www.ec.gc.ca/ee-ue/home/home_e.asp

Environmental Science and Technology Centre's response to pollution emergencies
www.etc-cte.ec.gc.ca/home/water_e.html

Birds Oiled at Sea program
www.atl.ec.gc.ca/boas/index_e.html

Proclamation of Bill C-15
www.ec.gc.ca/press/2005/050625_b_e.htm

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